IN THE CLAIMS

1. (currently amended) A computer-implemented process for segmenting image data, comprising the process actions of:

inputting an image;

segmenting said image using a mean shift segmentation technique employing anisotropic kernels; wherein segmenting said image comprises:

initializing kernel data;

for each of a set of feature points, determining an anisotropic kernel with a spatial component and a related color component;

associating a mean shift point with every feature point and initializing said mean shift point to coincide with that feature point;

updating mean shift points by iterative anisotropic mean shift updates; and

merging vectors associated with feature points that are approximately the same to produce homogeneous color regions.

2. (original) The computer-implemented process of Claim 1 wherein the anisotropic kernels comprise a spatial/lattice component and a space dependent range/color domain component.

3. (original) The computer-implemented process of Claim 1 wherein the anisotropic kernels comprise a spatial/lattice component and a range/color domain component that is not space dependent.

4. (cancelled)

5. (currently amended) The computer-implemented process of Claim [[4]] 1 wherein initializing the kernel data comprises the process actions of:

transferring pixels of said image into multi-dimensional feature points, x_i;

specifying an initial spatial domain parameter h_0^S and an initial range domain parameter h_0^r;

associating kernels with said feature points;

initializing means of kernels as the value of said feature points associated with kernels; and

setting initial kernel bandwidth matrices in the spatial/lattice domain as the diagonal matrix $H_i^S = (h_0^S)^2 I$ and in the range/color domain setting $h^r(H_i^S) = h_0^r$, where I is the identity matrix.

6. (currently amended) The computer-implemented process of Claim [[4]] 1, wherein for each of a set of feature points, determining an

anisotropic kernel with a spatial/lattice component and a related range/color component, comprising the process actions of:

for each feature point x_i, searching the neighbors of said feature point x_j, $j=1,\ldots,n$ to obtain all feature points that satisfy the constraints of the kernels;

iteratively updating a bandwidth matrix of the anisotropic kernel in the spatial domain,

modulating the bandwidth of the anisotropic kernel in the spatial domain; and

modulating the color tolerance of the related color component.

7. (original) The computer-implemented process of Claim 6 wherein the constraints of kernels are defined by:

$$k^2(g((x_i, x_j, H_i^S)) < 1; k^r \left\| \frac{x_i - x_j}{h^r(H_i^S)} \right\|^2 < 1$$

where H_i^S is the spatial/lattice bandwidth matrix and h^r is the range/color bandwidth parameter.

8. (original) The computer-implemented process of Claim 6 wherein the bandwidth matrix H_i^S is updated as:

$$H_i^s \leftarrow \frac{\sum_{j=1}^{n} \left\| \frac{x_i^r - x_j^r}{h^r(H_i^s)} \right\|^2 (x_j^s - x_i^s)(x_j^s - x_i^s)^T}{\sum_{j=1}^{n} \left\| \frac{x_i^r - x_j^r}{h^r(H_i^s)} \right\|^2}.$$

9. (original) The computer-implemented process of Claim 8 wherein the range/color bandwidth parameter $h^r(H_i^S)$ is updated as:

$$h^r(H_i^S) \leftarrow \sqrt{\frac{\lambda^{\cdot}}{\lambda}} \cdot h^r(H_i^S)$$

10. (original) The computer-implemented process of Claim 6 wherein the segmentation is a single image segmentation and wherein modulations are applied to exaggerate eccentricity and modify scale.

11. (original) The computer-implemented process of Claim 6 wherein the segmentation is video segmentation and wherein modulations are applied for exaggerating eccentricity, scaling static segments, and overall scale.

12. (currently amended) The computer-implemented process of Claim [[4]] 1, wherein updating the mean shift points by iterative anisotropic mean shift updates, comprises the process actions of:

for each mean shift point $M\ (x_i)$,

determining the neighboring feature points x_i;

calculating a mean shift vector $M\ (x_i)$ summing over all the neighboring mean shift points; and

updating the mean shift points;

until the change in the mean shift points is less than a specified amount.

13. (original) The computer-implemented process of Claim 12 wherein the mean shift vector is calculated as:

$$M_v(x_i) = \frac{\sum_{j=1}^{n} (x_j - M(x_i)) \left\| \frac{M(x_i^r) - x_j^r}{h^r(H_j^s)} \right\|^2}{\sum_{j=1}^{n} \left\| \frac{M(x_i^r) - x_j^r}{h^r(H_j^s)} \right\|}.$$

14. (original) A system for segmenting image data, comprising:

defining an anisotropic kernel of influence for each pixel in an image, wherein said kernel defines a measure of intuitive distance between pixels, where distance encompasses both spatial/lattice and range/color distance; and

assigning to each pixel a mean shift point initialized to coincide with said pixel;

iteratively moving each mean shift point upwards along the gradient of the kernel density function defined by the sum of all the kernels until they reach a stationary point; and

considering pixels that are associated with the set of mean shift points that migrate to the approximately same stationary point to be members of a single segment.

15. (original) The system of Claim 14, further comprising:

combining neighboring segments.

16. (original) The system of Claim 14, further comprising eliminating segments that contain less than a specified number of pixels.

17. (original) The system of Claim 14 wherein the image is a portion of video data and wherein distance further comprises temporal distance.

18. (currently amended) A computer-readable medium <u>encoded with</u> [[having]] computer executable instructions for segmenting image data, said computer executable instructions comprising:

inputting image data; and

segmenting said image data using a mean shift segmentation technique employing generally elliptical kernels wherein the computer-executable instruction for segmenting said image data comprises sub-instructions for:

initializing kernel data;

for each feature point, determining a kernel being a product of kernels with at least one of these kernels being elliptical;

associating a mean shift point with every feature point and initializing said mean shift point to coincide with that feature point;

updating mean shift points by an iterative anisotropic mean shift update; and

merging vectors associated with feature points that are approximately the same to produce homogeneous color regions.

19. (original) The computer-readable medium of Claim 18 wherein an elliptical kernel comprises a spatial component..

20. (original) The computer-readable medium of Claim 18 wherein a non-elliptical kernel comprises a color domain component.

21. (original) The computer-readable medium of Claim 18 wherein the computer-executable instruction for segmenting said image data using a mean shift segmentation technique, comprises a sub-instruction for defining the shape of a elliptical kernel as λDAD^T where λ defines the overall volume of the kernel, A defines the relative lengths of the axes, and D is a rotation matrix that orients the kernel in space and time.

22. (original) The computer-readable medium of Claim 21 wherein the computer-executable instruction for segmenting said image data using a mean shift segmentation technique, further comprises a sub-instruction to modify the shape of an elliptical kernel by varying λ, A or D.

23. (original) The computer-readable medium of Claim 19 wherein the image is a portion of video data and wherein the generally elliptical kernel further comprises a time component.

24. (original) The computer-readable medium of Claim 22 wherein by varying λ the spatial size of the kernel is adjusted.

25. (original) The computer-readable medium of Claim 22 wherein by varying A the shape of the kernel is varied.

26. (original) The computer-readable medium of Claim 25 wherein segmentation to segment elongated regions is encouraged by defining A as a diagonal matrix of Eigen values which is normalized to satisfy:

$$\prod_{i=1}^{p} a_i = 1$$

where a_i is the i^{th} diagonal elements of A, and $a_i \geq a_j$, for $i < j$; and wherein the smaller Eigen values of A are diminished by: $a_i = \begin{cases} a_i^{3/2} & a_i <= 1 \\ \sqrt{a_i} & a_i > 1 \end{cases}, i = 2, \ldots, p$.

27. (original) The computer-readable medium of Claim 25 wherein larger segments for static objects are created by

computing a scale factor s_t as

$$s_t = \alpha + (1-\alpha)\prod_{i=1}^{p-1} d_1(i)^2$$

where d_1 is the first Eigen vector in D, which corresponds with the largest Eigen value a_1. $d_1(i)$ stands for the ith element in d_1, which is the *x, y* and *t* component of the vector when $i = 1,2,3$, respectively, and α is a constant between 0 and 1;

setting α to 0.25;.

changing A to $a_i^{'} = a_i \cdot s_i, i = 2, \ldots, p$;

modifying A as $a_i = \begin{cases} a_i^{3/2} & a_i <= 1 \\ \sqrt{a_i} & a_i > 1 \end{cases}, i = 2, \ldots, p$ or modifying A as

$s_i = \alpha + (1 - \alpha) \prod_{j=1}^{p-1} d_1(i)^2$; and

changing global scalar λ as

$\lambda' = \lambda \prod_{i=1}^{p} \frac{a_i^{'}}{a_i}$.

28. (original) The computer-readable medium of Claim 19 wherein said spatial kernel has a constant profile, $k^s(z) = 1$ if $|z| < 1$, and 0 otherwise.

29. (original) The computer-readable medium of Claim 20 wherein said color component uses an Epanechnikov kernel with a profile $k^r(z) = 1 - |z|$ if $|z| < 1$ and 0 otherwise.